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MEADOW FESCUE:
ITS CULTURE AND USES.

BY

H. N. VINALL,

*Scientific Assistant, Forage Crop Investigations,
Bureau of Plant Industry.*



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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., March 29, 1909.

SIR: I have the honor to transmit herewith and to recommend for publication as a Farmers' Bulletin the accompanying manuscript on "Meadow Fescue: Its Culture and Uses," prepared by Mr. H. N. Vinall, Scientific Assistant in Agrostology in Forage Crop Investigations.

There is at present a great lack in the agricultural literature of this country of concise descriptions of the methods followed in the growing and handling of the different cultivated grasses, especially for seed production. This bulletin not only treats of the value of meadow fescue in meadows and permanent pastures, but also discusses in detail the production of seed and problems in connection with seed growing. The publication of such information should result in a wider use of this grass in pasture improvement throughout the East-Central States.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

MEADOW FESCUE: ITS CULTURE AND USES

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MEADOW FESCUE: ITS CULTURE AND USES.

INTRODUCTION.

For the past twelve or fourteen years meadow fescue has been an important crop in northeastern Kansas. The acreage devoted to this grass has, however, been extremely variable. This fluctuating tendency is due chiefly to changes in the price of seed. The meadow fescue seed crop has in some years reached a total valuation of over \$150,000 in the very limited section of the State indicated on the

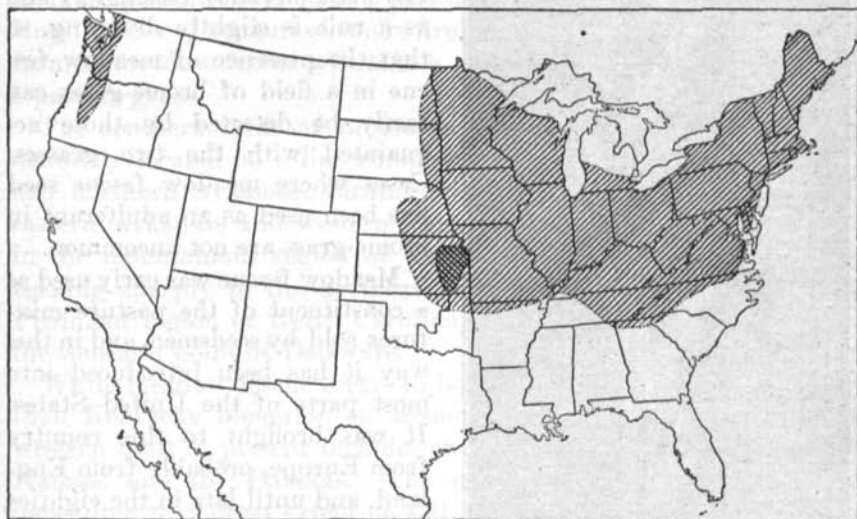


FIG. 1.—Map of the United States, showing the meadow fescue region. The cross-hatched portion in eastern Kansas indicates the area where most of the meadow fescue seed is now produced.

map shown in figure 1. The demand for meadow fescue seed is quite limited; hence, an undue expansion in production has caused in several years a decided fall in the price. The merits of the grass are such, however, that it is believed that a better knowledge of its usefulness will result in its being employed much more extensively, especially for permanent pastures throughout the timothy region.

Meadow fescue (*Festuca elatior* L., *Festuca pratensis* Huds.) is also locally known as "English bluegrass," notwithstanding the fact that in England it is called meadow fescue. The name English bluegrass should be discarded for the established name meadow fescue, as the use of both leads to confusion.

Meadow fescue is a strongly perennial grass with long fibrous roots. The seed stalks ordinarily reach a height of 15 to 24 inches on upland soil, but on rich, black bottom lands they often attain a length of 3 feet or more. The stalks themselves are rather bare, but there is usually an abundance of basal leaves, which have a shining surface and an intense green color, thus presenting a very pleasing appearance in the spring and fall. The panicle is not so open as that of brome-grass (*Bromus inermis*) (see fig. 2) and as a rule is slightly drooping, so that the presence of meadow fescue in a field of brome-grass can easily be detected by those acquainted with the two grasses. Cases where meadow fescue seed has been used as an adulterant in brome-grass are not uncommon.



FIG. 2.—Panicle of meadow fescue.

Meadow fescue was early used as a constituent of the pasture mixtures sold by seedsmen, and in this way it has been introduced into most parts of the United States. It was brought to this country from Europe, probably from England, and until late in the eighties very nearly all of the seed used in this country was imported. This seed was of poor quality, weighing only 15 pounds to the bushel, and the light seed with its accompanying high price are prominent causes for the slow advance in favor of meadow fescue with farmers. Its utilization has not been more general chiefly because farmers do not realize the value of using mixtures of perennial grasses for pasture purposes, but cling persistently to bluegrass and timothy and red clover.

Meadow fescue sown alone furnishes scant pasturage during the hot summer months, and its lack of rootstocks prevents its taking first rank as a pasture grass in any region where Kentucky bluegrass does well. Its value at present is fully appreciated only in the eastern parts of Nebraska and Kansas. It is quite probable that in all the region indicated on the accompanying map (fig. 1), except perhaps the extreme northern and northeastern portions, an increase in the use of meadow fescue would have a very beneficial effect on the pastures.

The ability of meadow fescue to survive in wet places when trampled by stock keeps such places productive in pastures where timothy, red clover, and Kentucky bluegrass fail, and, besides being strongly perennial, meadow fescue has the additional advantage of coming quickly and surely from seed, producing in a short time a firm sod and considerable pasturage.

In the East meadow fescue has shown itself to be almost as well adapted as orchard grass to the clay soils, and though not quite as productive it is rather more palatable than the latter. As the value of tame pastures over native pastures is better realized, and as the English idea of mixtures is more firmly established with the American farmer, meadow fescue will take a more important place, at least as a pasture grass.

The southern limit of profitable meadow fescue culture is quite definitely located on a line running through northeastern Oklahoma and northern Arkansas, turning slightly toward the north through eastern Arkansas and western Tennessee, but dropping south again in the mountainous region of Tennessee and North Carolina, then turning sharply to the northeast, except for a slight curve in the Piedmont region of North Carolina, until it reaches the Atlantic on the southern point of Delaware.

While meadow fescue seems to be slightly more drought resistant than Kentucky bluegrass on account of its deeper root system, its western limit at present includes only the eastern parts of Nebraska, Kansas, and the Dakotas. The northern boundary is indefinite, depending to a great extent on soil and moisture conditions; in New York it is well north, while in Michigan, on account of the aversion of meadow fescue to sandy soil, it drops south. Very little is known at present of the behavior of meadow fescue in the New England States. Meadow fescue is also well suited to conditions on the Pacific slope of Washington and Oregon, but at present is not extensively grown there.

In the following pages the intention is to describe as accurately as possible the methods of culture applied to the production of meadow fescue in that part of the United States where it has become

of the most importance, throughout eastern Kansas and southeastern Nebraska; also to point out its uses and indicate its value for other sections of the country where it is now used but sparingly.

CULTURE OF MEADOW FESCUE.

There is so little difficulty in getting a stand of meadow fescue that experienced farmers expect failure scarcely more often than in grain seeding.

Soil.—The soil best adapted to the production of meadow fescue is a heavy black loam. This grass has been noted growing in the most decided "gumbo" spots, and in these places, when the moisture was sufficient, no amount of trampling seemed to destroy it. It is not adapted to a light sandy soil, and the best yield of hay and seed is always secured from heavy soils rich in organic matter.

Preparation of the seed bed.—The seed bed is generally prepared by disking up a cornfield or plowing under grain stubble. The usual practice is to plow early in August, if convenient, then harrow and cross-harrow, firming the soil thoroughly and making it ready for seeding by the last of August. It is essential for the proper germination of any grass or clover seed to have a finely pulverized, well-firmed seed bed. This condition of the soil is best attained by the use of a subsurface packer followed by several workings with a spike-toothed harrow. Many farmers, however, do not have the packer, and as a substitute use the ordinary roller, loosening up the surface after it by attaching to the roller several sections of a harrow. This method is found satisfactory wherever tried, and in many cases means the difference between success and failure with grass seed. The roller should never be used when the ground is at all wet, and should always be followed by a harrow, so that the surface will not bake, but be left with a mulch of loose soil.

The amount of seed per acre used by different growers varies greatly. Throughout the fescue region, however, it is the most common practice to use from 10 to 15 pounds, and this amount is considered sufficient whenever a seed crop is the object. When seeded with a grain drill a half bushel usually produces an excellent stand and gives the best results. Most of the chief producers state that heavier seeding will give a larger yield the first year but that the field will soon become sod-bound and thereafter produce both a smaller quantity and an inferior quality of seed. A prominent grower of Lafontaine, Kans., however, declares that he has sown up to 1½ bushels of seed per acre with good results, thereby both increasing his yield and freeing the field from weeds. Under this system he has had 100 acres average 20 bushels per acre. Many have

found it very advantageous to sow clover in the meadow fescue, as it greatly improves the pasture, while the grass can be cut high for seed and leave a good hay crop of clover and fescue leaves to be cut later.

Covering the seed.—Meadow fescue seed can be sown broadcast and covered with a harrow as other grass and clover seeds usually are, but the general opinion is that a press or disk drill covering just a trifle more lightly than in sowing grain gives better results. This practice insures a uniform stand and maximum germination. For pasture purposes a double seeding, applied by cross-drilling 10 to 15 pounds each way, is suggested.

Time of seeding.—Undoubtedly the most popular time for seeding, as well as the best time for scientific reasons, is from August 15 to September 15, although many sow later with satisfactory results. The dates mentioned give the grass a good start in the fall and insure a seed crop the following season, thus avoiding the loss of a crop year in getting the grass started, as is the case in spring seeding. A field of 8 acres near Gardner, Kans., sown August 27, 1906, at the rate of one-half bushel per acre, was one of the best-appearing fields seen by the writer during 1907. It was harvested July 5, 1907, giving a yield of $18\frac{1}{2}$ bushels of seed per acre.

The extreme adaptability of meadow fescue as to date of seeding is shown by another field near Gardner, Kans., which was sown for hog pasture on April 20 with a mixture of meadow fescue and timothy. May 20 the grass was about 4 inches high, covering the ground perfectly, with a large percentage of meadow fescue in the stand. In this vicinity meadow fescue is preferred to alfalfa for hogs, as it starts so much more vigorously.

It is seldom the practice to use a nurse crop. Fall-sown meadow fescue gives a seed crop the ensuing year, while from that sown in the spring nothing is expected except a little fall pasture until the second year.

The seed crop.—Heretofore the production of seed has been the most important consideration in the growing of meadow fescue, and has been the cause of the large acreage seeded in eastern Kansas. The market for seed has been uncertain, however, and as it depends to some extent on the foreign demand there has several times been an overproduction with consequent low prices and close grading, the farmer not being able to respond to the pulse of a foreign demand as easily as to a domestic one. It is the general opinion among the producers that 5 cents a pound is the minimum price at which it is profitable to grow meadow fescue for seed. The price paid farmers has varied in the past decade from 3 to 15 cents a pound.

The commercial seed production of meadow fescue was begun in 1877, near Gardner, Kans. It proved so profitable with the originator, Mr. S. H. Ayers, that his neighbors began to buy seed and engage in the production of meadow fescue seed in preference to wheat, as it was quite permanent when once seeded, furnished splendid pasture after being cut, and for many years a hay crop was secured from the stubble. The maximum production was probably reached in 1903, although 1896 was also a good crop year. In 1903 a conservative estimate places the amount of clean seed produced in Kansas as over 130 carloads of 30,000 pounds each. The 1906 crop was less than half this amount, and the 1907 crop showed a further decrease.

The price paid in 1903 for meadow fescue seed ranged between 3 and 5 cents, while in 1901 it was 14 and 15 cents. The high prices of 1901 caused the enormous acreage of the following years and the great oversupply of 1902 and 1903, many seed houses buying sufficient seed to fill their orders for a year or more ahead. Another cause for the decrease in acreage has been the rust, which has lately become destructive in the meadow fescue fields.

The grades of meadow fescue seed run opposite to those of wheat.

After a car is examined the report is given in the percentage of chaff instead of that of pure seed, as 5 or 20 per cent instead of 95 or 80 per cent, meaning that 5 or 20 per cent of the bulk is trash or foreign seed. Grading has come to be a source of much discord between the grower and the dealer, since in years of overproduction the grading, which is at all times in the hands of the dealer, becomes more rigid and close.

Meadow-fescue is harvested for seed just as the field begins to take on the yellowish brown cast characteristic of a ripening grain field and the heads begin to droop on account of their weight. This in ordinary years is between July 1 and July 10. The grass is cut with an ordinary grain binder and placed in small shocks for curing. Careful growers put four bundles only in each shock and bind the tops together with twine to prevent injury from storms and loss of color through bleaching (see fig. 3).

A large percentage of the growers thrash their meadow fescue directly from the field, hauling it to the machine on hayracks with canvas stretched over the bottom, which saves the seed that shatters out. However, thrashing from the shock is warrantable only because it saves labor. An ordinary grain thrasher is used in thrashing with no changes except the shutting off of most of the wind from the fan and the addition of a special screen, although this latter is not indispensable, as fairly good work can be done with an ordinary wheat riddle. The brightest and heaviest seed is obtained by stacking the

fescue and thrashing after it has had sufficient time (six to eight weeks) to cure in the stack.

The yield of seed varies greatly. From 6 to 25 bushels per acre have been reported; 15 bushels is considered a good yield, and the average probably lies between 8 and 12 bushels. First-class seed weighs about 25 pounds per bushel. Opinions differ as to the advisability of pasturing meadows which are to be used in seed production. A considerable number of farmers who have large stock interests claim that they are able to pasture for a short time in the spring and again throughout the fall without injuring the seed harvest. Observation would lead to the belief, however, that



FIG. 3.—Field of meadow fescue in shock, showing the bands at the top.

the largest yields are obtained from fields which are not pastured in the spring and very judiciously, if at all, in the fall. If the growth is heavy in the autumn a slight grazing will do no harm, but heavy pasturing in the spring will lessen the vitality of the plant and thus tend to produce a light yield of seed.

The principal shipping points in Kansas for meadow fescue seed have been in the past at Gardner, Wellsville, Olathe, and Springhill in Johnson County; Overbrook in Osage County; Reading in Lyon County; Madison and Hamilton in Greenwood County; Fredonia and Lafontaine in Wilson County; and Marysville in Marshall

County. Some seed has been shipped from Lockwood and Nevada, Mo., but the whole State of Missouri has never furnished more than five carloads in any one year.

Hay.—Seed production has so overshadowed all other interests in meadow fescue growing that only a small quantity of hay is put on the market, very little of the grass being cut at the right stage of growth to make prime hay. For this reason there is no established price for the hay in cities. Several stockmen who are growing meadow fescue for hay exclusively claim that although the hay is somewhat stemmy and inclined to be slightly laxative, it is an excellent fat producer, and when mixed with timothy and clover improves the value of these as hay for general feeding purposes.

A crop of hay is sometimes cut after the seed harvest, but this is possible only when the harvest is followed by rains and the meadow is young and vigorous. A crop of this kind is largely leaves, and if mixed with clover makes a splendid feed, fully equal to timothy and clover for most animals. It can hardly be recommended for driving horses, however, on account of its laxative effect. Meadow fescue hay is almost as palatable as timothy, and chemical analyses indicate that its nutritive value is even higher. When used exclusively as a hay crop it is cut just as it is coming into bloom, about June 20 to 25. The yield is usually 1 to 1½ tons per acre, which, however, can be increased to 2 and even 3 tons by the application of barnyard manure. The aftermath is usually good, much stronger than timothy, and furnishes succulent pasturage until well into the winter.

Pasture.—For pasture, especially in mixtures, meadow fescue is one of the best grasses yet tried throughout eastern Kansas and southeastern Nebraska. Stockmen find it most valuable as an early and a late pasture. It is ready for the cattle in this region usually by the middle of March or the first of April, and it is pastured at this time for almost two months, when the stock are removed to native pastures. By the first of August the aftermath is beginning to show a good growth. In most cases, however, there is little rain during August, and it is September 15 or later before the aftermath is heavy enough to stand pasturing. Meadow fescue continues to grow, however, through the cool weather of fall and early winter, and even after snowfall furnishes considerable green feed if not too heavily pastured during the summer months. For this reason it is valuable to supplement native pastures during October and the early part of November before the cattle are put in the feed yard. It is superior to Kentucky bluegrass during the hot summer months, but is not equal to the native bluestem pastures for that part of the year. Meadow fescue, although it has no rootstocks, is not inclined to become bunchy or tussocky when pastured, as does orchard grass.

Meadow fescue is quite valuable for dairy cows, but its principal point of excellence is as pasture for fattening cattle. It has a splendid reputation among the feeders of eastern Kansas and southeastern Nebraska. Many claim for it a relatively high value as hog pasture, but it is only in localities where a shallow soil and the presence of hardpan prohibit the successful culture of alfalfa that it is used for this purpose. Brome-grass also outranks it in this respect, being evidently preferred by hogs when the two grasses are growing together.

The length of time during which a meadow will produce hay and pasture profitably depends altogether on its treatment. Meadows of this grass when treated with barnyard manure have remained productive from twelve to seventeen years. The most progressive farmers, however, make use of meadow fescue in a rotation, allowing a field to remain in meadow from three to six years only. For permanent pastures there is great advantage in mowing the weeds once or twice a year and applying a top-dressing of manure. The manure should always be spread with a manure spreader and only a light application given. For some time after this application the pasture will be useless, so that it is best to apply it to only one-half of the pasture land at a time, covering the halves in alternate years.

Mixtures with other grasses.—Meadow fescue is now used throughout all the region indicated on the map (fig. 1) as a prominent constituent in pasture mixtures and to a small extent for hay meadows. These mixtures of course should vary according to the latitude. In Nebraska, for instance, brome-grass, timothy, alfalfa, and red clover are most largely used with meadow fescue; in the central region Kentucky bluegrass and white clover are quite valuable, while farther south orchard grass and alsike clover prevail. To the east in this southern division, tall meadow oat-grass and the rye-grasses are added with good results, and on wet soils redtop is extremely valuable. In the western part of this region a considerable number of farmers are using alfalfa in connection with the grasses for pasture with splendid results, especially in increasing the amount of pasturage. Very little trouble is experienced from bloating when the pasture has less than 50 per cent of alfalfa.

On heavy soils the meadow fescue is likely to prove more than an equal in competition with the other grasses, but in localities especially suited to Kentucky bluegrass or brome-grass, as the case may be, meadow fescue is overcome and gradually crowded out. Its special value arises from its characteristic of coming surely and quickly from seed, thus occupying the ground to the exclusion of weeds and furnishing forage while the weaker grasses are getting started.

Rotative value of meadow fescue.—The most sensible and profitable system of rotation for meadow fescue when being grown for seed pro-

duction was found in use on a farm near Wellsville, Kans. On this farm meadow fescue is valued very highly as a soil renovator, the owner believing that its effect on corn is nearly equal to that of clover. His fields are arranged to accommodate meadow fescue three years, followed by two years of corn, then one year in small grain. This six-year rotation carries the meadow fescue through its period of greatest production and changes often enough to allow for the production of considerable corn, which is necessary in the feeding operations of this region and as a money crop. In the cornfields under this system the division between the first and second year from meadow could be distinctly noted by the darker color of the foliage and the greater vigor of the stalks. Whether or not any regular rotative system is followed, corn is generally the crop used to succeed meadow fescue.

Breaking up a meadow.—The breaking up of a meadow is generally carried on in the fall, as this allows the sod to decay and mellow before planting time in the spring. In the spring the field is either back-set or disked up thoroughly, when it can be planted or listed as desired. The sod of meadow fescue, although a trifle tougher than timothy, is not difficult to get into condition, never giving the trouble that brome-grass does in the Dakotas by resodding the field. Farmers declare that meadow fescue sod disintegrates so quickly that even the first cultivation of the corn is not difficult. All growers unite in declaring it a very useful crop for improving soil texture.

ENEMIES OF MEADOW FESCUE.

Rust.—Four or five years ago the oat rust (*Puccinia coronata*) began to be destructive in the fescue fields. It does not appear usually in any prominence until after harvest. Then, if the season is wet, the aftermath will be so badly affected that not only is the fall pasture ruined, but the functions of the plants are so hindered that they pass through the winter in a weakened state, and in the spring, instead of stooling out, the grass sends up few culms, and consequently the seed harvest is decreased.

The exact amount of decrease attributable to the rust can not be determined, but there is no doubt that the injury has been severe for the past four years, owing largely to the unusual amount of rainfall during the summer months. In the past, prior to the appearance of the rust, a second cutting of hay was expected in a majority of years; now it is looked upon as quite unusual. The aftermath in many fields was quite badly affected in 1907, the old meadows being the ones most subject to attack. In these the value of the pasture was very small.

Weeds.—The most troublesome weeds in the fescue meadows are whitetop (*Erigeron ramosus*), common cheat (*Bromus secalinus*), and Japan cheat (*B. japonicus* Thumb., *B. patulus* Mert. and Koch.), buckhorn, broad plantain, and dock. Of these the first two are by far the most serious. Cheat (*B. secalinus*) has always caused trouble in meadow fescue production on account of the very close resemblance of its seeds to those of the fescue. A number of farmers who have purchased and planted meadow fescue seed have found their fields to be largely cheat the following year. This can be attributed to some extent to the ability of the cheat to germinate almost perfectly even

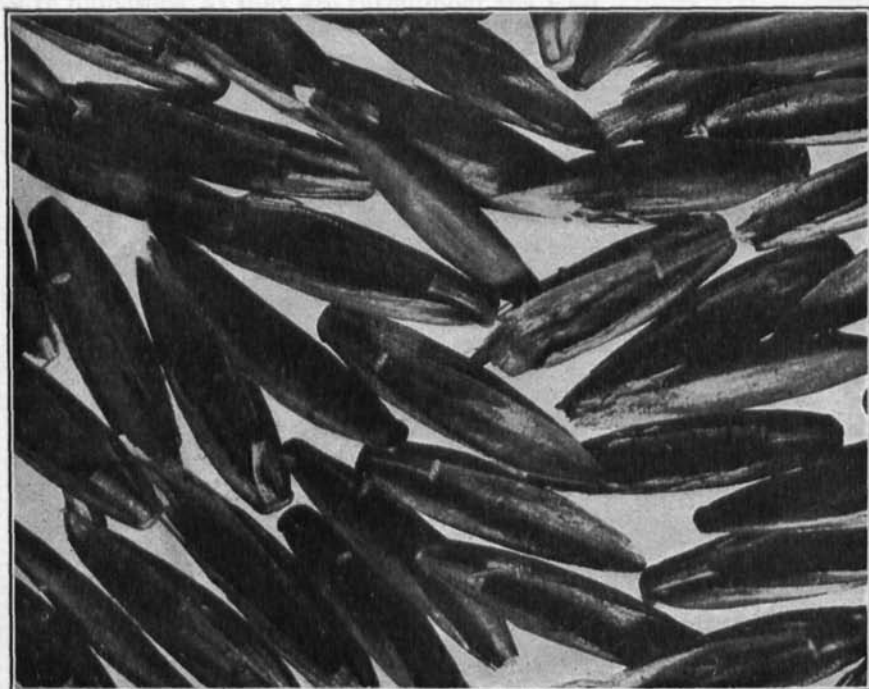


FIG. 4.—Meadow fescue seed. Magnified nine diameters.

under adverse conditions. The principal cause, however, lies in the carelessness of seedsmen when purchasing their supply of fescue seed, it being nearly impossible to separate cheat (*Bromus secalinus*) seed from that of meadow fescue when once they are mixed (see figs. 4 and 5). This difficulty is overcome in the fescue region to a great extent by the farmer buying seed from his neighbor which was produced in a field he knows to be practically free from cheat.

There has lately appeared in a few fields another form of cheat. This is a slender, slightly recumbent, pubescent species naturalized from Europe (*Bromus japonicus*). It was noted on several farms in

Johnson County, Kans., and has become quite well established along hedgerows and in fence corners. It seems to be a particularly aggressive species, and is feared by those who know it much more than *Bromus secalinus*, which appears to prefer the cultivated ground.

Whitetop (*Erigeron ramosus*) is troublesome only at irregular intervals. A number of fields visited during 1907 had much the appearance of fields of daisies. Meadows as badly infested as this were rare, but a great many contained enough of the weed to insure its further dissemination. It will be difficult to check its distribution over the fescue region, especially in meadows where no definite rota-

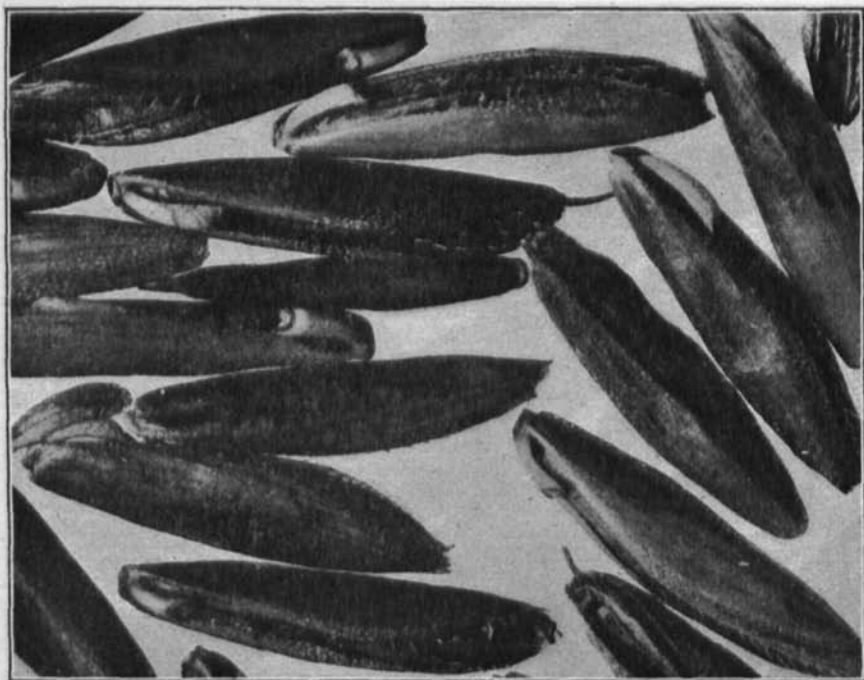


FIG. 5.—Common cheat (*Bromus secalinus*) seed. Magnified nine diameters.

tion is practiced. The new fields are always the cleanest and a short rotation tends to rid the fields of plantain and dock as well as whitetop.

MEADOW FESCUE IN THE EAST.

Reports from the agricultural experiment stations of Kentucky, Tennessee, Alabama, and North Carolina indicate that meadow fescue is a valuable grass in each of these States. Its strong points are enumerated by writers as drought resistance, frost resistance, and early spring and late fall pasturage. Where grown in New York

the results have been quite satisfactory, and a trial by farmers in Virginia has resulted in the conclusion that meadow fescue is valuable for hay and pasturage, furnishing earlier grazing than any other grass tried.

A thorough trial of meadow fescue at the Government experimental farm at Arlington, Va., develops the fact that on the poor, stiff, clay soil there a stand of meadow fescue can be obtained easily, the vitality of the seed being equal to that of any of the different grasses tried. This ability to come up early and strong in the spring is of great importance for pasture purposes, especially where weeds are numerous, as they are throughout the East.

Fifteen different mixtures of perennial grasses were tried at the Arlington Experimental Farm to determine the best combination for hay and for pasture. In all of these meadow fescue proved an exceedingly valuable constituent, improving the plot in appearance and in amount of forage produced. The plot giving the best results was a very complex mixture, containing orchard grass, timothy, brome-grass, redtop, English and Italian rye-grasses, Kentucky blue-grass, meadow fescue, tall meadow oat-grass, and red, white, and alsike clover. This plot early in the spring (March 16) showed splendid vigor, the meadow fescue and rye-grasses rooting strongly enough to prevent the upheaval by frost of any of the grasses in the plot; these grasses not only resist upheaval themselves but hold the other grasses in by their strong root systems. This plot was cut July 1 and yielded at the rate of $3\frac{1}{2}$ tons per acre.

Another plot which did especially well and showed the value of the meadow fescue consisted of English and Italian rye-grasses and meadow fescue. This plot was one of the earliest and best in the section, yielding at the rate of $2\frac{1}{2}$ tons to the acre.

These yields are not indicative of the exact value of meadow fescue as a hay grass when used alone, since the yield of plots containing meadow fescue only was low compared to that of plots on which standard grasses were grown.

The different plots of pure grasses (each one-twentieth of an acre in extent) gave yields of hay as follows:

	Pounds.
Meadow fescue.....	154
Redtop.....	160
Tall oat-grass.....	186
Timothy.....	180
Italian rye-grass.....	160
Perennial rye-grass.....	140
Orchard grass.....	144

It would appear from the yields here given that meadow fescue is not equal to timothy in a region where the latter does well, and the lack of leaves on the culms of meadow fescue would limit its use for

hay purposes in any locality. The aftermath, however, on the plots containing meadow fescue was invariably stronger and more succulent than that on plots of other grasses, and the heavy frosts of late fall did not injure it. This ability to produce a large amount of fall pasturage after being cut for hay compensates to some extent for the deficiency of meadow fescue in yield of hay.

The behavior of meadow fescue at the Arlington Experimental Farm leads the writer to believe that in the East it is a most valuable constituent for any pasture mixture, and that, in fact, it should be for many localities the predominating member of the group.

PRESENT IMPORTANCE AND FUTURE OF MEADOW FESCUE.

There is no doubt that the acreage of meadow fescue in eastern Kansas has decreased steadily since 1903. A careful investigator who has canvassed the situation thoroughly in buying seed for a firm in Chicago, Ill., claims that at least 40 per cent of the old meadow fescue fields of Johnson County have been plowed up in the last two years. The exact status of the industry in Gardner Township is shown by the assessors' returns, which state that there were 2,200 acres in meadow fescue in 1906 as against 1,000 in 1907. This township is the home of the meadow fescue seed industry, producing more seed than any other locality in the State. Results here are an index to conditions in all other localities, the same decrease being noticeable in Osage, Wilson, Marshall, and Greenwood counties. The cause of this decrease has already been explained in the discussion of the rust and the seed prices.

At the present value of the land in eastern Kansas a yield of 10 to 15 bushels of seed per acre should be accompanied by a price of 5 or 6 cents a pound to make its production profitable from a seed standpoint. Even then, meadow fescue would take precedence over wheat and other grains only because of its perennial habit in connection with the production of seed. It has superseded alfalfa in northeastern Kansas because it has been found difficult to grow the latter there on account of the heavy rainfall and shallow soil, much of the fescue land being underlaid by hardpan.

The future expansion of the area devoted to meadow fescue culture will depend on its use in permanent pasture mixtures and in hay meadows east and southeast of its present sphere. While not the very best of hay grasses, it is one of the most valuable of the domesticated grasses for seeding pasture land in any part of the region indicated on the map (fig. 1). It has long been a recognized fact that mixed pastures are as a rule more palatable to stock and that they cover the ground more evenly than any one grass alone, and in mixtures for this purpose meadow fescue is among the best.

TALL FESCUE.

Comparison of tall fescue with meadow fescue.—The opportunity to compare meadow fescue and tall fescue has been limited heretofore on account of the few fields of the latter growing in the United States. During the last two years cooperative experiments in growing tall fescue have been arranged in eastern Kansas for the purpose of comparing it with meadow fescue.

Tall fescue is apparently intermediate in character between meadow fescue and reed fescue. The purely scientific question of their relationship is left for discussion in botanical publications. The fact is quite apparent that tall fescue is at least an agricultural variety, and in field tests it has shown several important differences from meadow fescue. Seedsmen usually list meadow fescue under the technical name of *Festuca pratensis* and tall fescue under the name of *Festuca elatior*. This usage is well fixed agriculturally, but the two varieties do not represent distinct botanical species or subspecies.

Seed habits of tall fescue.—Tall fescue (see figs. 6 and 7) has an undesirable habit of ripening its seed very unevenly on the panicle, causing it to shatter badly. Growers are forced to harvest their tall fescue while the seed stalk is still quite green in order to save any considerable portion of the seed. This fault very likely accounts for the ordinarily low germination of the seed, and coupled with the fact that tall fescue sends up very few culms makes the yield light. From 3 to 7 bushels per acre were harvested last season in the same fields which gave a yield of from 12 to 18 bushels of meadow fescue seed. This was largely due to the fact that a clump of the latter grass possessed from two to three times as many seed stalks as one of the tall fescue. The growers complained, also, that nearly half of the seed shattered out before it could be taken to the machine.

The results of experiments at Pullman, Wash., have seemed to indicate that in the district around Pullman seed of tall fescue can be produced very profitably. Plots consisting of from two to three square rods yielded in cultivated rows at the rate of 24 bushels per acre. These rows were about 18 inches apart and were cultivated with a wheel hoe. Where broadcasted, about half of this quantity of seed was secured. It is worth while to note in this connection, however, that meadow fescue under the same conditions produced at the rate of from 30 to 40 bushels of seed to the acre.

The extremely high price of tall fescue seed makes an ordinary yield quite profitable. Owing to the fact that seed of this grass has been quite scarce, the price has ranged in the United States from 20 to 30 cents a pound. It is valued very highly in England, and as the true tall fescue is much desired for seeding meadows and

pastures there, England may provide a considerable market for American-grown seed when the fact is established that pure seed is being grown in the United States.

Rust resistance of tall fescue.—The foliage of tall fescue is quite abundant at the base of the plant, but the seed stalks as a rule are rather bare. Growing as it has been in the same fields with meadow fescue for the last two years in Johnson County, Kans., where the rust has been quite destructive, there has not yet appeared the slightest sign of rust on tall fescue.

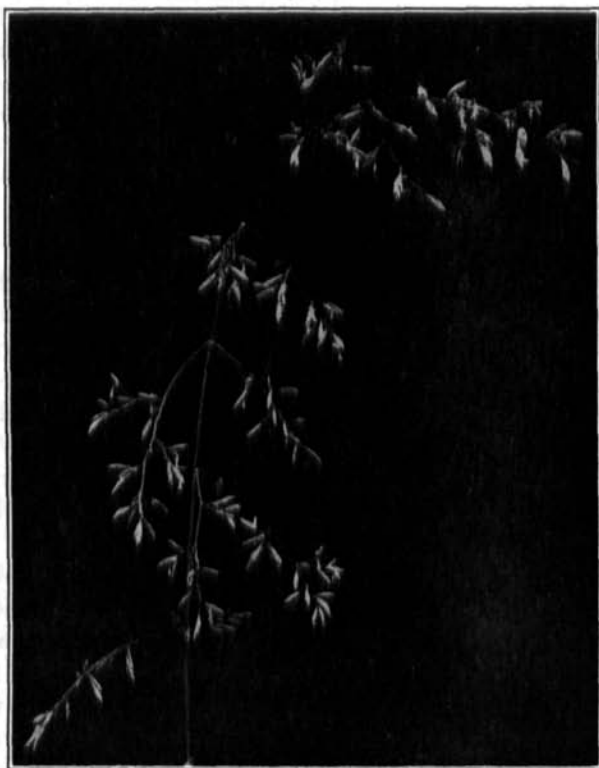


FIG. 6.—Panicle of tall fescue.

Inoculation tests in the greenhouse have demonstrated the fact that it is possible to artificially inoculate tall fescue with the rust prevalent on meadow fescue. Its resistance, therefore, may be due largely to its greater vigor. If the destructiveness of the rust continues to increase in the meadow fescue fields of eastern Kansas, growers will necessarily be obliged to substitute some grass which is not so badly affected by it. Tall fescue gives most promise of filling this want. Another advantage which arises largely from its rust resistance is the strong aftermath that tall fescue always produces

after the seed harvest. One grower near Edgerton, Kans., cut very nearly a ton of hay per acre from his tall fescue field two weeks after the seed harvest. Others secured an aftermath fully equal to this.

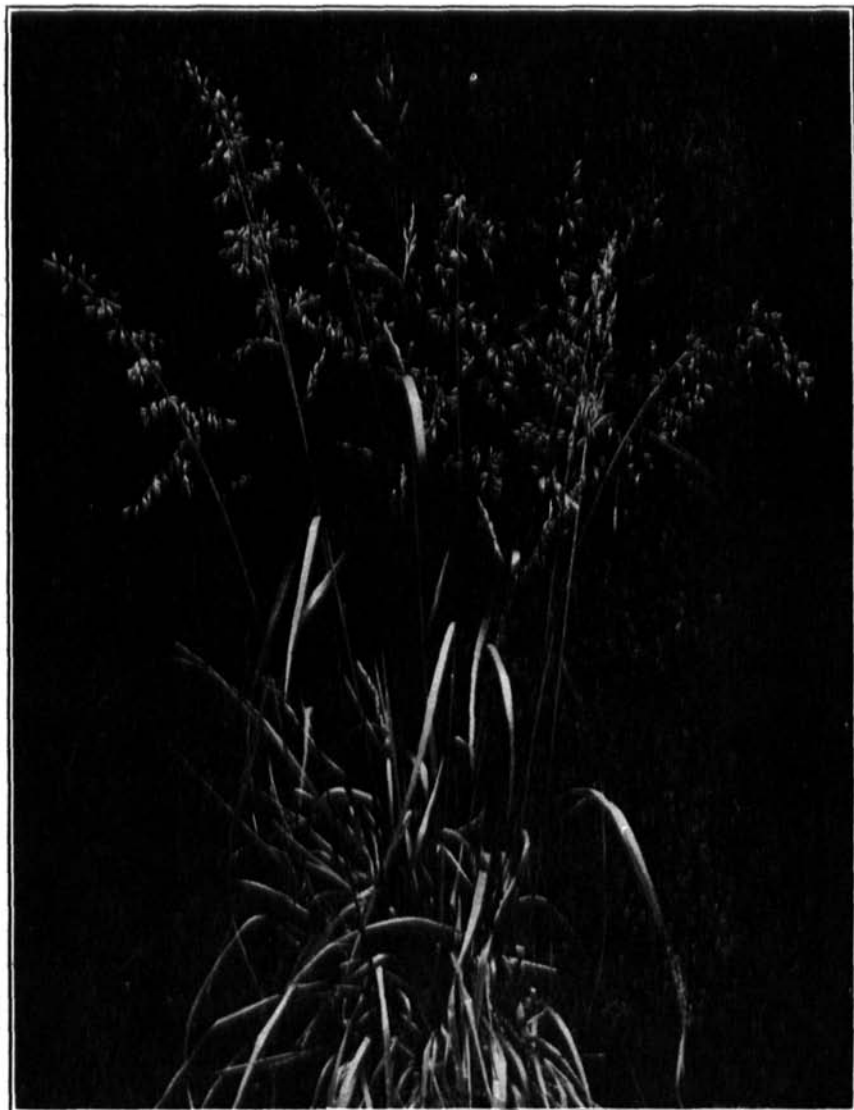


FIG. 7.—Tuft of tall fescue in bloom, showing foliage and seed habits.

Importance of tall fescue.—It would appear that tall fescue may become of some importance in this part of Kansas, and if the seed can be produced cheaply enough it will largely replace meadow fescue in pasture and meadow mixtures for the East-Central States, because it invariably makes a more vigorous growth of foliage.

SUMMARY.

(1) Meadow fescue is largely called "English bluegrass," but that name should be discarded for the correct one.

(2) Meadow fescue is most important in eastern Kansas and south-eastern Nebraska.

(3) This grass should be utilized more largely in the pasture mixtures of the East-Central States.

(4) The peculiar advantages of meadow fescue for use in mixtures are its certain and strong germination from seed, its palatability, and its ability to endure trampling and to thrive in wet, "gumbo" spots.

(5) The production of meadow fescue seed has been quite an important industry over a considerable section in eastern Kansas, but the area devoted to it is decreasing on account of the prevalence of rust and the uncertainty as to price of seed.

(6) The worst impurity in commercial meadow fescue seed is ordinary cheat (*Bromus secalinus*), which is quite common in the meadow fescue fields of Kansas.

(7) A substitute for meadow fescue if the rust makes its production unprofitable can be found in tall fescue, which appears to be rust resistant.

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